

VI. *A Synopsis of the Calculation of the Transit of Mercury over the Disk of the Sun, the 25th of October 1743. by Mr. John Carlyn.*

Read Nov. 25.
1742.

THE Equal Time of the true δ at <i>Greenwich</i> . . .	} D H ' "	Oct. 24. 22 15 58
The Equation of Natural Days add		16 11
Apparent Time of the true δ . . .	Oct. 24. 22 32 9	
At which time the true Place of the <i>Sun</i> and of <i>Mercury</i> seen from the Earth	} m, 12 36 44	
The Geocentric Latitude of <i>Mercury</i>	} South. 9 37	
The Elongation in 5 Hours (<i>i. e.</i>) the $2\frac{1}{2}$ immediately preceding and following the δ	} 29 16	
The Difference of Latitude in the same time	} 4 24	
Therefore the Angle of the apparent Way of φ with the Ecliptic	} 3 33 00	
And the Distance of their Centres at the time of their nearest Approach	} 9 31	
And the Motion of Interval between that and the δ	} 1 26	
And the hourly Motion of <i>Mercury</i> in his Path over the Disk of the <i>Sun</i>	} 5 55 $\frac{1}{12}$	
H h 2		And

And the Motion of the $\frac{1}{2}$ Duration from the first to the last exterior Contacts of the Limbs	} 0 ' "	
		13 15
And the Motion of the same for the interior Contacts . . .	} 13 4	
Hence, the Time of the Interval from the δ to the Middle .	} 14 32	
of $\frac{1}{2}$ the exterior <i>Transit</i> . .	2 14 22	
of $\frac{1}{2}$ the interior <i>Transit</i> . .	2 12 30	

Hence,

The first exterior Contact of the Limbs	} h ' "	
	8 32 19	
The first interior Contact . .	8 34 11	} Oct. 25. Morning
The nearest Approach of the Centres, or Middle . .	} 10 46 41	
The last interior Contact . .	0 59 11	} Afternoon.
The last exterior Contact, or End of the <i>Transit</i> . .	} 1 01 3	

This Computation is made from Tables * which give the ascending Node of *Mercury* at the Time of this *Transit* 6' 17" too forward, according to the Result of very accurate Observations made of that in the Year 1723, by Dr. *Halley*, Dr. *Bradley*, and Mr. *Graham*. Therefore making the Calculation with this Correction of the Place of the Node, the Times of the several Circumstances of the *Transit* will be as follows:

* *Philosophical Transactions*, N° 386.

	h	'	"	
The first exterior Contact .	8	29	21	} Oct. 25. in the Morn- ing.
The first interior Contact .	8	31	05	
The nearest Approach of the Centres	10	46	6	
The last interior Contact .	1	01	7	} Afternoon.
The last exterior Contact .	1	02	51	

This *Transit* may be very aptly compared with that which happened on the 24th Day of *October* 1697 *; as happening at the End of a remarkable Period in *Mercury's* Motion, by which he is nearly in the same Situation, with respect to the *Sun*, at every Completion of it. Dr. *Halley* in his Series of Moments, in which *Mercury* is joined to the *Sun*, &c. (published in the *Philosophical Transactions*, No 193.) makes the Middle of this *Transit* at 11' past Six in the Morning the 24th Day, or the 23d Day at 18^h 11' *p.m.* and the Distance of the Centres of the *Sun* and *Mercury* 10' 04''.

It may not be amiss to examine and compare these Numbers by such Observations as were made of this *Transit*, and may be depended on, and thereby to collect the Difference between Computation and Observation; and whatever Error arises in Excess or Defect by a proper Application to the *Transit* of 1743. it is imagined, will correct it with a greater Degree of Exactness, than a Calculus from any Theory whatsoever.

There was only the Egrefs of *Mercury* in the *Transit* of 1697. capable of being observed in *Europe* †;

* Mean Period 46 Years 1^d 5^h 43' 42''.

† *Flamsteed's Hist. Cælest.* Lib. II. Fol. 32.

which

which was done at *Nuremberg* in *Germany*, by Mr. *Wurtzelbaur*, and at *Paris* by *Monsieur Cassini*: At *Greenwich* Clouds prevented it. At *Nuremberg* Mr. *Wurtzelbaur* observed *Mercury* to go off of the Disk of the *Sun* * at $8^h 45 \frac{1}{2}$ *mane* about $73 \frac{1}{2}$ Degrees from the Vertex of the *Sun* to the Right Hand; and *Monsieur Cassini* observed the same accurately at $8^h 10' 24''$ *mane*; therefore from the known Difference of Meridians of these Places, the Egrefs must have happened at *Greenwich* at $8^h 1'$ *mane*.

The Observation of Mr. *Wurtzelbaur* will greatly avail at coming at the Duration of the *Transit*. It is mentioned, that *Mercury* left the Limb of the *Sun* $73^\circ 30'$ from his Vertex to the Right. Now at that time at *Nuremberg*, the Angle of the Ecliptic with the Vertical passing through the *Sun's* Centre, was $42^\circ 3' 5''$; therefore the last Point of Contact on the *Sun's* Limb was observed $31^\circ 26' 55''$ from the Ecliptic to the South, and consequently his Latitude was $8' 28''$ South at that time.

To find the Point on the *Sun's* Limb of the Ingress, in order to come at the Duration of the *Transit*, we must be beholden to Computation, and the Theory of *Mercury's* Motion: I have therefore, from the Tables from which the above Times of the *Transit* of 1743 are drawn, carefully computed his Motion along his Path crossing the Disk of the *Sun*, and find that he moved along it after the Rate of $5' 53'' \frac{1}{4}$ in an Hour, and the Difference of Latitude in 5 Hours $4' 21''$, and his Elongation $29' 7''$: Therefore the Angle of his

* Vertex to the Right, it says, *a Nadir Solis ad dexteras*; but it is a manifest Mistake, as any one upon Trial may find.

visible Way was $8^{\circ} 29' 50''$, which, doubled, and added to $31^{\circ} 26' 55''$, gives $48^{\circ} 26' 35''$, his Distance, on the Limb of the *Sun* from the Ecliptic also to the Southward at his Ingress on it; therefore the nearest Approach of his Centre to that of the *Sun* was $10' 19''$, and the Length of the Path run during the *Transit* $25' 14''$, and consequently the time of running it $4^h 17'$, the half of which $2^h 8' \frac{1}{2}$, subtracted from $20^h 1'$, the End of the *Transit* at *Greenwich*, gives the Middle there at $17^h 52' 30''$, earlier by $18' \frac{1}{2}$ than the Series of Moments, &c. give it.

Now as the said Series makes the Middle of the *Transit* of 1743, at $11^h 2'$ *mane*, and as it corresponds with that of 1697; and the Computation of that is $18' \frac{1}{2}$ too late by the Series of Moments, &c. it may be reasonably expected, that the same Computation for this of 1743 will be so much too late too; and if so, the Middle may be put down at $43' \frac{1}{2}$ past 10, or $44'$ at farthest, *October* 25th in the Forenoon.

By Computation from the Tables above-mentioned, with the Correction of the Node, I make the Distance of the Centres at the nearest Approach in 1697, to be $10' 33''$, but by the Observations of Mr. *Wurtzelbaur* it turns out only $10' 19''$, less by $14''$. Should therefore their Distance in 1743 computed in the same manner at $9' 10''$ be as much diminished, the Duration of the *Transit* will be protracted no less than $5' 24''$, and the first Contact will be $2' 42''$ earlier, and the last so much later, than the Times above-mentioned for them.

N. B. In the Computation of the *Transit* of 1743, the Semidiameter of the *Sun* is supposed $16' 14'' \frac{1}{2}$, and that of *Mercury* $4'' \frac{1}{2}$; but in that of 1697, have taken

taken *Mercury's* only $3\frac{1}{2}$, imagining the precise Moments of the first and last exterior Contacts are not observable; but that the Ingress is seen some little time later, and the Egress sooner, than the true times thereof. I have all along spoke of the Motion of *Mercury*, without mentioning that of the *Sun*, whereas, in Reality, it is that of them both jointly; but as we may suppose the *Sun* to stand still during the *Transit*, it will then be considered as the apparent Motion of *Mercury* alone for that Time.

VII. *A Letter from Mr. Robert Campbell of Kernan, to Dr. Mortimer, Secr. R. S. concerning a Man who lived Eighteen Years on Water.*

S I R,

Dec. 1. 1742.

Read Dec. 9.
1742.

THOUGH unknown, at the Request of Mr. *Malcom*, I trouble you with an Account of the extraordinary Abstinence of *John Ferguison*, a Native of the Paroch of *Killmellfoord* in the Shire of *Argyle*.

About 18 Years ago he happened to overheat himself on the Mountains, in Pursuit of Cattle, and in that Condition drank excessively of cold Water from a Rivulet, near by which he fell asleep; he awaked about 24 Hours after in a high Fever: During the *Paroxysm* of the Fever, and ever since that time, his Stomach loaths, and can retain, no kind of Aliment, except Water, or clarified Whey, which last he uses but seldom, there being no such thing to be had by
Persons